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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE•



March 5, 1938

Scarred Victors

See Page 152

A SCIENCE SERVICE PUBLICATION

Do You Know?

A machine has been invented for planting trees.

Beavers are clean housekeepers but muskrats have dirty homes.

About half the cities in the United States have dental clinics for their school children.

Laundries often use blue wrapping paper because this color keeps linen from turning yellow.

A new laboratory for studying poultry diseases will be established by the Department of Agriculture for northern states.

The British Museum has the oldest known scrap of paper, a fragment from China with writing on it, made about the second century A.D.

Use of an airplane enabled a medical superintendent and Indian agent to prevent serious epidemics of measles in two communities in Alberta, Canada.

Streamlined motor trains have been selected—as more practical than elephants or camels—to carry sightseers over grounds of the Golden Gate International Exposition in 1939.

A chemist points out that the famous iron pillar of Delhi, India, has lasted 1,600 years with almost no rusting because it is in a dry climate, and not because of some mysterious lost art of handling metal.

SCIENCE NEWS LETTER

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QUESTIONS DISCUSSED IN THIS ISSUE

Most articles which appear in SCIENCE NEWS LETTER are based on communications to Science Service, or on papers before meetings. Where published sources are used they are referred to in the article.

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Birds that rear two broods of young during the season have two song periods.

King Solomon's throne of ivory overlaid with gold is known to have been made by artists from Tyre.

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ASTRONOMY

Saturn May Have Tenth Moon, British Astronomer Suggests

Six Million Mile Gap Between Eighth and Ninth Satellites Should Have Something In It

SATURN, whose nine satellites make it the champion among the planets in this respect, may really have ten companion bodies, it is now reported to the British science journal, *Nature* (Feb. 5).

John Miller, London astronomer and member of the British Astronomical Association, suggests that a tenth satellite may be found in the region between the present eighth and ninth satellites of brilliant Saturn. The orbit of the tenth satellite, if it exists, should be about 2,000,000 miles farther out from the one known as Iapetus and 4,000,000 miles

inside the orbit of the outermost satellite, Phoebe.

The 6,000,000-mile gap in space between Iapetus and Phoebe has long intrigued astronomers. If the approximate placing of the satellites follows the astronomical rule known as Bode's law, then satellite 10 should be found at the distance Mr. Miller suggests.

Bode's law is a long-known empirical rule which has no physical explanation. The so-called law states that there is a regular progressive increase in the mean distances of the planets from the sun. The law holds good for all the planets except Mercury and Neptune and cannot be regarded, says Mr. Miller, as merely coincidental truth.

If one takes the distance of Mercury's orbit from the sun as a starting point and calls the distance from Mercury's orbit to the orbit of Venus 3, then the distance of the other planetary orbits from that of Mercury turn out to be roughly in the geometrical progression 6, 12, 24 etc. This same general relationship seems to apply also to satellites, states Mr. Miller.

In his report to *Nature* Mr. Miller sets up two tables of values; one for the observed distance in miles between the orbits of the respective known satellites and another giving the distances based on geometrical progression. In most cases the agreement for the nine known satellites is fairly good. There is only one large discrepancy. That is the blank hole in the table which Mr. Miller suggests is the spot for the yet undiscovered satellite.

In 1905 Prof. W. H. Pickering reported a faint satellite of Saturn which has never been confirmed. Mr. Miller suggests that perhaps the tenth satellite is the missing object reported 33 years ago by Pickering.

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AURORA INDOORS

This spectacular effect showing the streamers and arcs of the Northern Lights was produced in the Hayden Planetarium to demonstrate the colorful and awe-inspiring by-products of the current epidemic of sunspots which has aroused world-wide interest. As, on the real sky, this man-made Aurora Borealis dips and dances and changes its colors from apple green to glowing red. The picture was made by Charles Coles, chief photographer of the American Museum of Natural History.

GENERAL SCIENCE

"Brains of the World, Unite!" Might Rescue Troubled Globe

THE realization is growing that something must be done, in the interests of intellectual freedom and progress, to bring the scientists and scholars of all nations closer together.

Language differences, varying philosophies, political conditions, economic rivalries, military conquests and other disturbing factors jeopardize the peace and freedom under which science can do its best work. Fascism and communism, as well as extreme actions and ideologies in democratic countries, often provide barriers to certain phases of scientific research and application.

National scientific groups, such as the American and the British Associations for the Advancement of Science, vocalize the fervent hope of scientists and scholars that science remain "wholly independent of national boundaries and race."

While there is, and quite rightly, much viewing with alarm with regard to the international science situation, an immense amount of quiet, almost rou-

tine, cooperation occurs day by day. Scientific literature flows freely, except in isolated instances. International congresses are held. The unfortunate thing is that there is not enough sounding of the trumpets over such accomplishments of peace and science. Nutrition studies that may very well result in better food for millions inevitably receive less notice than a bombing of a civilian population.

Defensively aggressive are the necessary rescues of intellectual refugees from the dictator-ridden countries. Protective protests at encroachments on intellectual freedom must continue.

"Brains of the World, Unite!" For a long-time pull of educational effort, such a slogan might be a catalyst to bring to the round world's conference table the scientists, scholars, educators and the other intellectual workers who could in a generation remould our ideas and ideals. If inhibiting precedents can be unshackled, there are enough brains in the intellectual organizations of today to determine how this can be done.

Science News Letter, March 5, 1938

PHYSICS

New Theories in Physics Enter "Practical" Field

Offer New Explanation of Electrical Conductivity; Device Forecasts Results of Atom-Smashing Experiments

THE NEW theories of atomic physics—quantum and wave mechanics—are clarifying knowledge of the structure of solids and thus bringing these seemingly "impractical" playthings of the mathematical physicist into the realm of material objects which one can see and touch; objects which an engineer or layman could class as "practical".

Speaking before a joint meeting of the Optical Society of America and the American Physical Society, Prof. L. A. DuBridge of the University of Rochester described the newest advances of the attack of science on the secrets of matter.

Unifying Theory

The nature of the structure of solids like metal crystals, or glass, or insulators, is only in its beginnings, he emphasized; but already the quantum and wave mechanics has interpreted—from a single starting point—many properties each of which formerly needed its own little separate theory to account for it.

In particular, the old theory of the conduction of electricity through metals has been revised and physicists no longer picture a metal bar as containing myriads of so-called "free" electrons which could move about within the metal and conduct the current.

Central idea of the new picture is that a crystalline solid, like a metal, may be regarded as a single giant molecule. For a crystal of ordinary size this "molecule" will contain in the neighborhood of a hundred thousand million, million, million atoms. Or the figure 1, followed by 23 ciphers.

All these millions upon millions of atoms packed into a regular array in a single crystal produce effects quite different than if they acted individually as they would in a gas. The little energy levels of the atoms between which electrons jump to absorb or release energy are no longer peculiar to the atoms singly. There are energy levels for the whole crystal. And it is the movements of electrons into these energy levels of the crystal which determine many of the properties of crystals.

Crystals like those of sodium, potassium or silver are pictured by the new theory as consisting of electrons occupying the bottom of two broad bands or zones of energy. If the metals are cooled to absolute zero all the electrons are in the bottom compartment of what might be called an energy "basement".

By old theories it was predicted that solids cooled to absolute zero would possess no energy because the energy of motion of the electrons would be stopped. And without motion there was no energy. By the new theory it is predicted that even at absolute zero the electrons have motions and energies from 50 to 100 times greater than it was formerly believed they possessed at temperature of 1,000 degrees.

When an electric field is applied to metals of this group the outer electrons (or those at the top of the energy basement) will move up to the next lowest unoccupied energy levels. They move with the electric field and give rise to current. If vacant energy levels exist, to which the electrons can jump, then the metal is called a good conductor of electricity. Sodium, potassium and silver are notably good electrical conductors.

No Vacant Levels

If the electrons have no vacant levels to which they can go when an electric field is applied because these levels are already occupied, there is no current produced and the solid is known as a poor conductor, or a good insulator. Thus the strange situation may arise where one solid may have twice as many "free" electrons as another and yet be an insulator while the latter is a good conductor; the reason being that the "free" electrons have no place to go.

"The new theories," said Dr. DuBridge, "offer, for the first time, a picture of why one substance is a good insulator or a good conductor. The necessary condition for conduction is that there shall be unfilled but allowed levels immediately adjacent to the occupied levels."

The new theories also offer explana-



FORECASTING DEVICE

Prof. Vladimir Karapetoff of Cornell University, with his newly invented device for forecasting results of atom smashing when applied to any given element.

tions of heat conduction in solids and predictions of the binding forces in crystals. Moreover, the optical properties of solids—like the photoelectric effect on which all photocell operation is based—are taking on a new understanding through analysis by the new theories. The magnetic properties of crystals are also being studied and, said Dr. DuBridge, "for the first time a satisfactory theory of ferromagnetism is being developed."

Compact Device

Prof. Vladimir Karapetoff of Cornell University showed a compact little device which can be set up on a table of elements to show the results of an impact upon any element or isotope by any one of several different kinds of subatomic "bullets" used in experiment. By properly using the scale the operator can read the theoretically possible resulting products of this atom smashing and the ejected particles that should come off.

The work of forecasting disintegrations and transmutations has become increasingly complex, and yet more and more scientists and amateurs are becoming interested in it, said Prof. Karapetoff. Nearly all the stable elements have been made radioactive by bombardment experiments and the number of possible forms of matter now runs into the hundreds instead of the simple 92 forms found in the old tables of the chemical elements. Moreover, the number of pos-

sible kinds of bombarding particles has been increased to nine, in Prof. Karapetoff's scale, so that the varieties of the various impacts which can occur set up a great mass of data.

Prof. Karapetoff's new scale brings order out of this drudgery and forms a convenient tool for the experimental and theoretical physicist in his nuclear research. The scale gives all the theoretically possible transmutations of elements; quantum-mechanical computations and the experiment are necessary to decide on those which can actually take place.

Sun's Expenditure

To maintain the existing radiation pouring out from the sun it is necessary that each one of the trillions upon trillions of protons and neutrons contained in it must give out a photon of light every 20,000 years. Calculations of the sun's energy and estimates of its radiation production were presented by Dr. Arthur E. Haas, mathematical physicist of the University of Notre Dame, before the physicists' meetings.

Every second the sun liberates photons represented by an enormous number consisting of the figure 2 followed by 45 ciphers, or 2,000,000,000,000,-000,000,000,000,000,000,000,000 photons a second.

The total number of particles in the sun (the protons and neutrons) Dr. Haas estimates as consisting of 1.2×10^{67} particles, or a number represented by 12 followed by 56 ciphers.

It takes the sun about 20,000 years to liberate a number of photons equal to the number of particles it contains.

Once in 20,000 Years

"We must therefore assume," said Dr. Haas, "that each primordial particle contained in the sun experiences, at least in intervals of about 20,000 years, some reaction leading to the emission of a photon, or we must assume that extremely 'hard' primary photons produced in the interior of the sun split into a variety of softer photons on the way to the surface of the sun, or perhaps we must combine both assumptions."

Cosmic rays may be the most piercing and powerful of all radiation but one modern steam generating plant develops about the same amount of energy as do all the cosmic rays incident on the surface of the earth. Dr. Thomas H. Johnson of the Franklin Institute's Bartol Research Foundation estimated that the total cosmic ray energy striking

the earth comes out to be about a million kilowatts. This is the same energy rating as the new steam generator plants of the South Philadelphia electric utility company.

The total number of rays striking the earth per second, said Dr. Johnson, is 8×10^{17} , or 800,000,000,000,000,000. This makes the cosmic ray current to the earth .13 amperes.

Science News Letter, March 5, 1938

PHYSICS

Harvard to Have Largest Cyclotron Atom Smasher

A NEW type cyclotron, a 100-ton atom-smasher that promises to yield the most accurate information ever obtained concerning atomic disintegration, will be put into operation at Harvard University this summer. It will be the largest of the twenty-odd such "big guns" now in use throughout the world in man's assault on the atom.

Major development in the Harvard apparatus is a special device that will enable the experimenters to use atomic bullets of only one known energy, a procedure that promises to permit far more precise and reliable quantitative measurements of the forces involved in atom-splitting than have heretofore been possible.

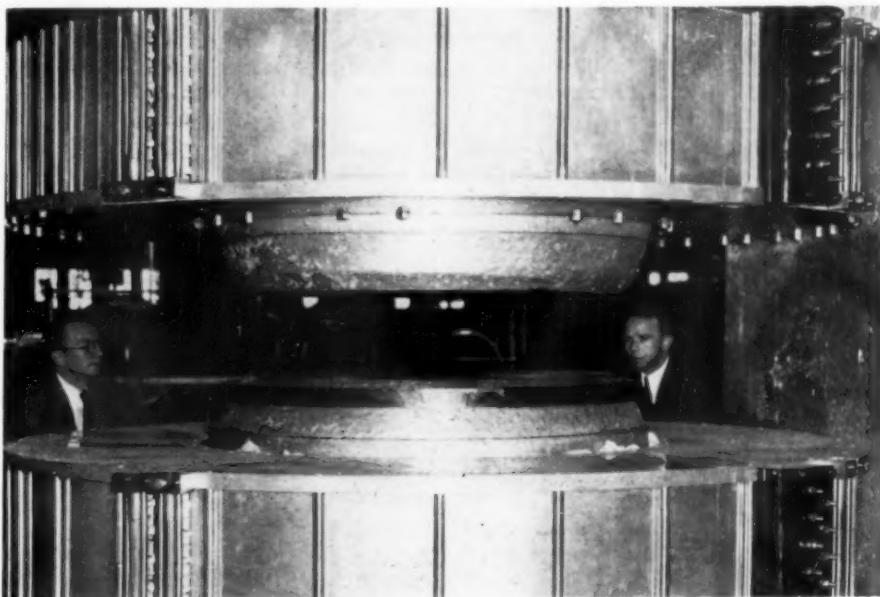
At the outset the Harvard cyclotron is expected to produce atom-smashing projectiles of about eight-million-electron-volt energies. Further development, however, is expected to enable the production

of projectiles of much higher energies.

In direct charge of the cyclotron are four of Harvard's outstanding young physicists, Prof. Kenneth T. Bainbridge, Prof. Jabez C. Street, Prof. Harry R. Mimno and Dr. Roger Hickman. They have supervised the construction of the apparatus during the past year.

The new feature of the Harvard cyclotron, energy-control, is obtained by steering the stream of ions through a special magnetic field that attracts, or combs out, all the particles of a single, known energy content. Only these uniform projectiles are used in the bombardment and thus the energy needed to produce disintegration and the characteristic internal energies of the nuclei will presumably be accurately measurable. Other cyclotron experiments have used the entire stream of ions, the energy content of which may vary considerably.

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NEWEST ATOM-SMASHER

The Harvard University cyclotron is inspected by Prof. Jabez C. Street (left) and Prof. Kenneth T. Bainbridge.

SAFETY

Youth Is a Killer

Deadliest Drivers Are Boys Just Old Enough to Vote, Yet They Are Also the Most Skillful Car Operators

By DR. FRANK THONE

DEATH behind the driver's wheel, in the terrible annual auto accident toll, is not a grim, old, bearded man with a scythe. He wears the beardless face of a boy. Flaming youth at the wheel is the deadliest foe of today's highway-using public.

Remorseless statistics, presented before the American Association for the Advancement of Science by a critically analytic scholar, prove the indictment beyond possibility of denial. Dr. Harry M. Johnson, who led the study under the auspices of the Highway Research Board, sums up the case briefly and dramatically:

"If we pick the same number of drivers in each age-group, and count the fatal accidents that each group has, we find that those who are 45 to 50 years old kill the fewest persons in a year. While they are killing 66, the 16-year-olds are killing 201, the 17-year-olds 186, the 18-year-olds 148, and those between 19 and 21 are killing about 215 persons for each 100,000 drivers on the road."

Second Dangerous Age

"The drivers older than 45 tend to become more deadly each year, reaching the average rate for the whole population about age 64 to 65, whereupon the rate suddenly falls. This decline may be due to the older drivers driving less and less, instead of better and better."

Dr. Johnson and his associates in the study found most of their material for analysis in the records of one state, Connecticut. It is one of two in the entire Union where really careful track is kept of all reported accidents, the other being its neighbor, Rhode Island.

Connecticut makes an excellent sample of present-day American population. Though not large in area or total number of inhabitants, it contains some rather typical middle-sized cities as well as considerable stretches of strictly rural regions, and it has upon its western boundary the largest metropolitan area in the Western Hemisphere. Its people include all gradations from poor to rich, from ignorant to well-educated, from newest immigrants to oldest Colonial

stock. A better cross-section could hardly be found.

Connecticut's motor laws require reporting of every accident that involves death or injury to any person, or property damage in excess of \$25. The Commissioner of Motor Vehicles makes a special effort to see that these laws are enforced.

Dr. Johnson, however, is a realist about the probabilities of having all accidents reported. He says: "It is not to be supposed that all the non-personal accidents reportable by law are actually reported: perhaps half of them are. Probably nearly all the fatal accidents are reported, and a very large proportion of the non-fatal accidents which involve serious personal injury."

Bad at Outset

Since the study was based only on accidents actually reported, it really makes no difference how many went unreported, so far as Dr. Johnson's figures are concerned.

One might reasonably expect a high accident rate from boys and girls who have just learned to drive and are trusted alone in a car for the first time. Such proves to be the case.

Sixteen years is the minimum age for drivers' registration in Connecticut. For every 100,000 licensed 16-year-old drivers, 200.6 were involved in fatal accidents a year. The average for the entire driving population of all ages is only 113.9 per 100,000.

With a year or two added to his age, Young America becomes slightly less deadly on the road. The rate per hundred thousand goes down to 186.4 at 17 and to 148.3 at 18. Just why, Dr. Johnson does not undertake even to guess, especially in the light of what follows.

For why, after such improvement, should the approach of legal maturity signal a slump so sudden and so bad? During the ages 19, 20, and 21, the youth of our land are veritable devils on wheels. Per 100,000 drivers of those ages, the number involved in fatal crashes stands very close to 220 for all three years. This is very nearly three times the rate (bad as it is!) for their

parents in the conservative forties and fifties, who have about 75 killers on the road per 100,000 drivers.

Middle-aged Saul may slay his thousands, but youthful David slays his triads of thousands.

Better by 25

After Young Hopeless has cast his first vote he again suddenly improves. By the time he is 23 he is not much more lethal than he was at 18, and by his twenty-fifth birthday he is distinctly less so. In his thirties, married and settled down, he continues to improve, and by the time he is 45, with Junior getting his first driving lessons (and first safety homilies—which he will of course disregard just as Dad did) the "old man" reaches his all-time low as a road menace.

After early middle life, Dr. Johnson finds, drivers again begin to become more unsafe, and in their sixties the rate appears to go up sharply. However, the smaller number of older drivers involved in accidents, especially in fatal accidents, makes the last part of his curve somewhat less dependable than the first. The more so, since a good many elderly persons hang onto their drivers' licenses without using them much, perhaps through unwillingness to admit, even to themselves, that they are no longer really fit to be trusted with a car.

Youth Crashes Hard

The figures for fatal accidents, just outlined, are paralleled fairly closely by those for non-fatal personal accidents and for damage to property. With this interesting divergence: that youthful drivers' excess in fatal accidents over their elders' is greater than their excess in non-fatal injuries, and also in accidents involving property damage only. In other words, young people are not only involved in more accidents than are their elders, but on the whole they are involved in worse accidents as well. When youth crashes, it crashes plenty hard.

There is a hint as to the possible cause for this in some traffic figures which Dr. Johnson obtained in the District of Columbia. During the first five months of 1936, Washington police authorities suspended the licenses of all



convicted speeders. The rate of suspensions among drivers from 16 to 20 years old was 2.3 times as high as the rate for the whole population. The rate for drivers in the next higher five-year age group was nearly as high, and in the 26-30 year group it was still nearly 1.3 times the average. This tends to confirm in cold figures the general popular impression, that young people are most addicted to speed, as well as to getting into accidents.

However, cautions Dr. Johnson, "This does not prove that the killers are speeders and that the speeders are killers. Indeed, taken alone, it does not prove that any speeder is also a killer. But we do know that in many situations the speed of the car determines whether it will crash or not; and in the fact that the worst speeders and the worst accident-makers belong to the same age-group one finds good reason for inquiring more closely how these persons drive."

Skilled Deadliness

One very discouraging fact about the whole business is that these young hellions who as a class get into the most and worst accidents are also the most skilled, if any of the drivers' tests now in vogue mean anything.

We are all familiar by now with the batteries of impressive apparatus that are in use in a number of places. They test your keenness and quickness of sight, your ability to tell a red light when you see one, your quickness of reaction. They put you in the driver's seat of a dummy car and let you try to keep out of bad traffic situations un-

rolled on a screen panorama before your eyes. All this is supposed to show how good you are as a driver.

Well, the kids score highest on these tests, hands down. And then go out and score highest also in breaking necks—their own and yours, too, if you happen to be around at the time.

Regardless whether the tests really tell anything about real driving skill, it is probable that young drivers do have greatest skill in handling cars under road conditions. It may be that it is their judgment rather than their skill that fails them when accident-conditions impend.

"Perhaps it is not so much a question how skillfully a person can drive as whether he will wrongly estimate the skills he has," suggests Dr. Johnson.

Women Not so "Dumb"

Inevitably the question of woman's alleged "dumbness" as a driver came up in discussion, when Dr. Johnson presented his paper. But apparently the female of the species is less deadly than the male, in the matter of auto accidents. However, it is hard to make the figures mean anything, because the average woman driver spends less time at the wheel than the average man and drives at more favorable times of the day.

Another point on which data are quite lacking is the emotional state of the drivers involved in accidents. The youth of 21 is legally a man, but in emotional reactions he may still be a child, it was suggested. "Don't know," answered Dr. Johnson, "Haven't any figures."

Again: some psychiatrists thought that women in the late twenties and the late thirties ought to show critical rates; and again it could only be reported that the women involved were so few that any attempt at statistical handling would be quite undependable.

In response to another question, however, Dr. Johnson could report that he had access to real figures, and that they enabled him to give a rather good bill of health to one much-berated group of drivers: taxicab operators. Their apparent recklessness would seem to be in reality assurance born of a knowledge of their own skill. What the raw youth at the wheel *guesses* he can do with his skill, the taximan *knows*; or he doesn't take the chance. After all, it doesn't take many accidents to spoil his record—and put him on the blacklist. He's just plain got to keep himself out of accidents.

Summing up at the end, Dr. Johnson said: "If the age-relations which we have found among these driver-populations hold nation-wide, then some 3,085 persons were killed on our highways last year because the operators from 16 to 20 years old drove worse than their elders, and some 7,787 persons were killed because operators not older than 25 years drove worse than their elders.

"Let the experts find a remedy—if they can."

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Science News Letter, March 5, 1938

GEOLOGY

Modern Prospecting Methods Locate New Oil in Illinois

OIL WELLS in places regarded as impossible before 1930, located by systematic use of modern scientific prospecting methods, have led to the discovery of eight new oil pools in southern Illinois and the increase of the state's known oil reserves by at least 100,000,000 barrels, it was reported by Dr. M. Leighton, Illinois State Geologist.

Found as a result of a planned search, these new oil pools are in an area regarded as barren before 1930. Realizing, as a result of intensive field work, that there should be domes within the great Illinois Basin, the state geologist's forces, with some private companies, began an intensive search for such oil traps, located a number of probable traps by geophysical methods, and proved the correctness of their findings by bringing in producing wells on eight of them.

Modern prospecting methods have cut drilling losses more than fifty per cent. Wildcat drilling (drilling in areas where there are no producing wells) resulted in bringing in oil only once in every ten attempts during 1937 when the well was sunk only on a "hunch." When the suspected area was first gone over by geologists with modern methods, the score was one producing well for every four wildcat drillings.

With Illinois oil production already tripled by these new fields, 150 or more geologists working for oil companies are now at work endeavoring to locate new oil pools, declares Dr. Leighton.

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Luminous signs shaped like deer have been placed along some of Germany's country highways to prevent motorists from striking wild deer that may dart across these roads at night.

MUSEUMS

Smithsonian Institution Has Real Old Cable Car

RELIC of the good old days when Dad (or even Granddad) was a boy, a real cable car has been added to the Smithsonian Institution's collection illustrating the evolution of transportation. The city of Seattle is the donor.

The cable car, says Carl W. Mitman, Smithsonian head curator of arts and industries, was characteristic of a quaint phase of mass transportation in the transition period between the slow horse car and the then new and then unreliable electric trolley car.

It may seem silly, to oldsters, to explain how the cable car worked but for young people Mr. Mitman explains that the cable railway was simple in operation but cumbersome and costly. An endless cable pulled by steam power at the end of the line moved between the tracks just below street level. Beneath the car was a mechanical gripping arrangement that grasped this moving cable like a hand, so that the car was pulled along at the same speed as the cable. The grip could be disengaged by the "gripman" by a lever device, so that the car could be stopped at will by allowing the cable to slip through the mechanism.

Science News Letter, March 5, 1938

ARCHAEOLOGY

1200 B.C. Portrait Gives Ancient Idea of Jehovah

WHAT did Jehovah, God of Israel, look like—as people of the Old Testament pictured him?

Biblical Israelites ventured no real portraits. Other nations might surround themselves with statues of their deities, or engraved pictures, or bas-reliefs. But the ten commandments forbade graven images. And even though Israel gave in to temptation to make a golden calf, and even though some Israelites had a weakness for clay figurines of heathen goddesses, there was no known attempt to portray Jehovah.

Special interest, therefore, is aroused by discovery of a portrait which gives the modern world a fairly good idea of how the ancient world visualized Jehovah. The portrait is a bas-relief from the twelfth century B.C., unearthed at Ras Shamra in Syria, where a Canaanite city stood.

French archaeologists, directed by Prof. Claude Schaeffer of the French

National Museums, are finding ruins of Ras Shamra a veritable treasure city for evidences of lost history.

The bas-relief shows the deity El, mentioned in the Old Testament as a name for absolute Deity, and later, Prof. Schaeffer says, becoming God of Israel under the name of Jehovah, or Yahweh.

The Canaanite sculptor has carved a striking profile of a venerable, stern-faced individual wearing a beard and dressed in ankle-length costume and high peaked headdress. He sits stiffly on a high, richly ornamented throne with a footstool. Facing is the small king of the city, devoutly holding up his scepter and a pitcher containing some offering.

Portraits of El have been known before, but none of so early a century, which pictures El at the very time when the Israelites were fighting for their promised land under Yahweh's guidance.

The bas-relief is unfinished. Enemies invading Ras Shamra from overseas rudely interrupted life in the Canaanite city. This portrait of El was buried in the sculptor's wrecked home, to wait 3,000 years for a public showing.

Science News Letter, March 5, 1938

SAFETY

Battle-Scarred Work Shoes Testify for Safety Work

See Front Cover

ELOQUENT testimony for safety measures among industrial workers are the battered shoes pictured on the cover of this issue of the SCIENCE NEWS LETTER. They are five out of 150,000 safety shoes, 75,000 pairs, worn last year by the workers of the Bethlehem Steel Company. The toes tell their own story. In each case something heavy dropped upon the shoe, and in each case the worker escaped with no injury or only a minor one. An inner cap of steel on these safety shoes will bear up under terrific impact.

An analysis of accident reports at one of the larger Bethlehem plants indicates that 18 years ago, when safety shoes were practically unheard of, injuries to toes or feet accounted for nearly half of the "lost-time" accidents. Of 213 such accidents that occurred in a year's time in this pre-safety shoe era 83 were to toes. Last year, when practically all workers wore safety shoes, there were only seven accidents of this description. Bethlehem's Director of Safety gives safety shoes the major credit for this striking reduction in toe injuries, typical also of the experience in other plants.

Science News Letter, March 5, 1938



INVENTION

Remote Control "Cannon" Increases Oil Recovery

FIIFTEEN gun barrels, firing .30 caliber bullets through an oil well casing hundreds of feet below the surface, promise to increase oil production in many fields where several rock strata bear oil. During drilling, each oil stratum encountered is recorded on the well log. Later, when the well is cased to the bottom, the cannon is lowered to the level of each oil stratum, and fired, punching holes in the casing to let in the oil from that bed.

Controlled electrically from the well head, this cannon may be lowered as much as two miles below the surface, and fired when it is opposite any desired rock bed. Accurate revolution counters tell the operators exactly how far below the surface the cannon is at any time. Using this method, many oil sands can be tapped by one well, saving the almost prohibitive cost of drilling one well for each oil horizon, or waiting until one horizon has stopped producing, then pulling part of the casing, until the next higher one is exposed.

Science News Letter, March 5, 1938

ENGINEERING

Head of Carnegie Tech. To Receive Lamme Medal

AWARD of the 1937 Lamme Medal is to be made to Dr. Robert E. Doherty, president of the Carnegie Institute of Technology, the American Institute of Electrical Engineers has announced.

The medal, to be presented at the June convention of the Institute in Washington, D. C., has been granted for Dr. Doherty's "extension of the theory of alternating current machinery, his skill in introducing that theory into practice, and his encouragement of young men to aspire to excellence in this field."

The Lamme Medal was founded by a bequest from the late Benjamin G. Lamme, chief engineer of the Westinghouse Electric and Manufacturing Co.

Science News Letter, March 5, 1938

SCIENCE FIELDS

AVIATION

Airplane Skis Streamlined For Landings on Snow

CANADIAN airplanes operating in snowy regions now have streamlined skis, thanks to aerodynamic research in the laboratories of the National Research Council of Canada.

With the coming of winter's snows, wheels and floats of airplanes are replaced with skis to allow the planes to taxi over snow drifts. Conventional airplane skis were a disadvantage in the air because they have an air resistance of three times that of the wheels.

Wind-tunnel research, in which artificial gales were blown against various designs of skis, enabled government engineers to perfect skis that offer less drag than the wheels that they replace.

Science News Letter, March 5, 1938

PSYCHOLOGY

Poor Arithmetic Students Can't Name Own Fingers

COUNTING on your fingers to do sums is generally considered bad form—baby stuff which arithmetic teachers do their best to eradicate. Now psychiatrists find that inability to count on the fingers, or to recognize different fingers, which must amount to the same thing, is linked with inability to do arithmetic. This finding and all its implications were reported by Drs. Alfred Strauss and Heinz Werner, of the Wayne County Training School at Northville, Mich., to the American Orthopsychiatric Association.

Finger agnosia is the technical term for the condition. In testing for it, the examiner touches one of your fingers and asks you to name the finger touched. Or he may ask you to touch your third finger, or your fifth finger. The test, continued along these lines, showed that boys who were poor at arithmetic, although they were good at reading, could not recognize their fingers. Boys who were good at arithmetic, though poor at reading, had no trouble in recognizing their fingers.

Ability to recognize different fingers

is probably part of what is called the body schema, meaning "a sort of diagram of our physical selves existing in our minds," the psychiatrists explained. Examination after death of patients who had had finger agnosia, or inability to recognize their fingers, showed injury to the part of the brain where this diagram of the physical self is probably made.

In their report the psychiatrists stated that they do not believe the finger agnosia is the only cause of inability to do arithmetic. It may be a symptom of a disturbance in the number concept and both this symptom and the arithmetic inability may be due to the same underlying condition.

Science News Letter, March 5, 1938

ENGINEERING

Tips on Tires Useful To Average Motorist

HERE are some important tips on tires recommended at the meeting of the Society of Automotive Engineers for use by operators of large fleets of buses and trucks, whose yearly investment in tires outranks that of the average motorist a thousand to one. They apply also to passenger cars.

1. If you wish to increase the non-skid life of your tires from 15 to 30 per cent., keep them at the proper inflation by weekly checkups. Running even four pounds below proper pressure on the tires of a passenger car may mean as much as 16 per cent. loss in tread-wear.

2. When the tread wears smooth get a complete retread job. By this you can obtain from 70 to 80 per cent. of the original mileage, said J. E. Hale of the Firestone Tire and Rubber Company. For a tire with a tread life of 20,000 miles retreading should bring the total mileage up near 35,000. Taxicab companies do this regularly and expect their tire casing to be retreaded at least two or three times. The cost of a good retread job is about half the cost of the original tire.

3. Realize that high speed driving cuts tire mileage. Rubber is much less resistant to wear when warm than when cold. A 4-ply tire on a medium priced motor car has the air temperature in the tube increased by something over 70 degrees when traveling 65 miles an hour, due to the heat generated by the continual and rapid flexing of the tire. In terms of pressure this temperature rise means an increase of 5 pounds per square inch.

Science News Letter, March 5, 1938

AGRICULTURAL ECONOMICS

WPA Takes a Long Look at Cotton-Picking Machines

UNEMPLOYMENT resulting from the possible development of a really successful cotton-picking machine does not look like a really crucial national problem to the Works Progress Administration.

In the first of a new series of pamphlets on changes in farm power and equipment, the moderately optimistic conclusion is reached that "In comparison with the volume of unemployment during recent years, any increase which might result . . . appears to be relatively unimportant—scarcely more than estimated variations in unemployment from one month to the next in 1936."

Indeed, the authors of the new publication, Dr. Roman L. Horne, agricultural economist, and Dr. Eugene G. McKibben, agricultural engineer, even see an eventual net gain to society.

They remind us: "Although the plight of the unfortunate people displaced should not be minimized, neither should concern for their future obscure the fact that picking cotton by hand is slow and tedious work. In the long run, society will gain by any reduction in the man-hours required to produce a given quantity of cotton."

At present, and for the immediately foreseeable future, mechanical cotton pickers will have to fight the existing economic and social setup for every acre they gain. The machines in their present stage of development are costly to build. In their operation they reduce the value of cotton harvested about 12 per cent. by gathering too many leaves and other forms of trash. They also leave about 5 per cent. of the cotton unpicked.

Machine picking requires large fields on level land. Much of the cotton is already raised on level land in Mississippi Delta country, along the Gulf Coast, and in Texas; but most of the landholdings are small. To make the necessary mergers of plantations, or the assembling of small farms into large cooperatives will require the overcoming of much inertia and many traditions—both of them powerful forces for conservatism in the rural South.

The present study is recognized as being only preliminary. Government economists are now preparing to conduct a longer, more intensive survey. The results of this new study will probably not be ready for publication in less than two years.

Science News Letter, March 5, 1938



WHERE AMERICAN EXPEDITION WILL DIG

View of the ancient city of Van, looking towards the citadel. In the center is what was probably a public square or possibly a market-place, with surrounding shops.

PHYSICS

Rival Types of Baseballs Given Scientific Tests

THE NATIONAL Bureau of Standards, where almost every conceivable item ranging from an elevator to a clinical thermometer is put through its paces to see that it stands up and behaves, is going to bat to settle once and for all the winter stovepipe league's most bitterly contested verbal battle:

Which baseball is livelier, that of the American or the National League?

Scientific tests now being conducted can be expected to shed scientific light on the question which has consistently popped up wherever fans and ball players meet: Why has the American League consistently reported higher batting averages than the senior circuit?

While no Robot Ruth will stand up at the plate and bat out homers with measured precision, tests under the supervision of Dr. H. L. Dryden of the Bureau will accurately measure the resilience of the balls used in the American and International Leagues, and in the National League, it was stated.

A special machine devised by Bureau scientists will hurl wooden projectiles at baseballs so that the two collide at a relative speed similar to that of bat meeting horsehide coming up from a fast ball pitcher's hurling arm.

Because a fast ball probably travels the 60 feet between the box and home plate at a rate close to 120 feet a second, and because the bat is moving fast also, making a high relative speed, the scientists in charge had to drop any idea of testing the ball's resiliency by dropping it. The ball would not be travelling fast enough. "The impact of a ball dropped from the top of the Washington Monument, or higher, on to the pavement below is probably not as great as that of the bat hitting a fast ball," a statement from the Bureau says.

An air gun will fire a one-pound hardwood projectile representing the bat at speeds up to 200 feet per second against the ball. After impact, the ball and projectile will be caught in ballistic pendulums, by means of which their speeds can be determined. The resilience or "liveliness," it is explained, is measured by the ratio of the relative speed after impact to the relative speed before impact.

The machine doesn't take up the question of the raised stitches on the National League horsehide vs. the not-so-raised stitches on the ball made famous by the long-distance clouting of Joe di Maggio and the Babe.

Science News Letter, March 5, 1938

ARCHAEOLOGY

Van, Ancient City in Turkey, To be Explored by Americans

AMERICAN archaeologists will set out for Turkey this spring in hope that an ancient city called Van will yield important secrets of history.

Ruins they plan to excavate once formed a capital and fortress of a kingdom that rose and fell between about 840 B.C. and 600 B.C. Buried records, it is believed, will explain how the kingdom dealt with its formidable neighbors, before Scythian armies destroyed the capital.

The joint expedition to Van is undertaken by Brown University and the University of Pennsylvania, with such well-known archaeologists in charge as Prof. Robert P. Casey of Brown, Prof. Kirsopp Lake, retired professor of Biblical literature at Harvard, and Horace H. F. Jayne of the University Museum, University of Pennsylvania. Three summers of excavation are planned.

Prof. Casey believes that, if enough cuneiform writings can be unearthed at Van, the kingdom's history can be traced, and this will add to understanding of the Biblical books of Genesis and Kings. Bible scholars have gained much historic background material from Babylonian and Assyrian ruins, but the region of Turkey, or Asia Minor, may also have its version of ancient international affairs to reveal.

Science News Letter, March 5, 1938

ANTHROPOLOGY

Arabs, Indians Related, Blood Type Shows

AMERICA'S pure-blood Indians and the purest-blood Arabs are closely related, says Dr. William M. Shanklin of the American University of Beirut.

Dr. Shanklin, who has been investigating blood types of tribes in the Syrian desert and farther east during a period of several years, has concluded that the two races have the same identical type of blood, scientifically known as blood-group O.

That almost all pure-blood Indians belong to blood-group O, rather than to other blood types found among the world's peoples, had been determined by previous researches. Dr. Shanklin has made the first studies of this kind in the Syrian desert, where the Rwala tribe of nomad Arabs has been living for centuries. Dr. Shanklin has reported his results to the Society for Experimental Biology and Medicine.

"The high percentage of group O among the Rwala is wholly unexpected and most striking," stated Dr. Shanklin. "The decrease in O in some of the tribal camps is in direct proportion to the amount of admixture with the Negro slaves in those particular camps."

Scientists divide mankind into seven different blood types, one of which is the Pacific-American, characterized by a high percentage of group O frequency. Most scientists assume that the human race was originally all of group O, the frequency factors known as A and B,

found in other types, having arisen separately through later changes.

The American Indians are very high in group O, above 90 per cent. in many pure tribes, and it is generally conceded that they migrated across Bering Strait from an original center of prehistoric civilization thought to have been somewhere in central Asia.

"A similar explanation may also apply to the Rwala Arabs," says Dr. Shanklin, "who traveled a much shorter distance."

Science News Letter, March 5, 1938

EXPLORATION

Drift Toward North Pole Is Proposed Expedition

Capt. "Bob" Bartlett, Noted Arctic Explorer, Suggests Party of Young Men on Floe or in Icebreaker

CAPT. Robert A. (Bob) Bartlett, hardy Newfoundland who is this continent's foremost veteran of the Arctic, has sounded a call for "three or four young fellows" or an icebreaker and crew to carry out a drift expedition from the Alaska coast toward the North Pole similar to the feat just completed by four Soviet Russian scientists.

Warmly praising the achievement of the Russians in making detailed scientific observations through a nine-month vigil on an ice floe that drifted from the North Pole toward the Greenland coast, Capt. Bartlett told Science Service that such an expedition would serve to complete knowledge of the other half of the Arctic basin.

"I'd be glad to do it," he declared, "but some people consider me too old. It's a good chance for some young fellows."

The Arctic veteran, who accompanied the late Admiral Robert E. Peary as far north as 87 degrees 48 minutes north latitude on Peary's historic dash on foot to the North Pole in 1909, called such an expedition as he proposes the natural complement to the work of the Russians.

Either a small group of men could drift on an ice floe or the proper type of wooden ship, imprisoned in the ice and clear of the Siberian coast where ice pressure might destroy it, could carry out the work.

"It would be necessary to start from the Alaskan coast in the fall of the

year," he explained. Ice conditions for the type of boat necessary are best at that time of the year, while starting from Alaska is necessitated by the need for avoiding the Siberian coast.

Such a party would drift northwestward in the direction of the Pole, on the same general line as the Russians drifted, south from the Pole approximately along the tenth meridian west—both drifts being across the icy "roof of the world."

Fridtjof Nansen, famous Norwegian explorer, made a roughly similar trip in the *Fram* from 1893 to 1896, drifting from the Bering Sea to a point near Spitzbergen, while caught fast in the ice. But, Capt. Bartlett believes, such a journey today would produce valuable results because of the many major scientific advances since that time and the improved instruments men on such an expedition would have at their command.

Interested particularly in the shape of the ocean floor, Capt. Bartlett pointed out that such a group would have as an aid the sonic depth finder with which it might investigate the contour of the ocean bottom and the depth of the Polar seas.

The four Russian scientists, whose work he praised in warm terms, have made important contributions in knowledge of oceanology, magnetology and general Arctic science. They have made actual fact much that was only theory before, he concluded.

Science News Letter, March 5, 1938

SUMMER NATURE CAMP

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CHEMISTRY

Fireproofing of Fabrics Can Be Done in Home

A CURTAIN blown into a gas flame, an overheated iron on an ironing board or a rug too near an open fireplace—puff! and a fire starts. Half of the \$350,000,000 U. S. annual fire toll is to private homes and property, and fabrics too close to flames are blamed for much of it.

Something can be done about it. Fireproofing cloth and other material is simpler than doing the family wash. The type of fireproofing most easily applied in the home is made from borax, boric acid and hot water, all ingredients easily obtained. The formula recommended by the U. S. Department of Agriculture is 7 ounces of borax and 3 ounces of boric acid powder dissolved in 2 quarts of hot water.

Articles to be treated are dipped in the warm solution, wrung out by hand or through a clothes wringer, and hung out to dry on the family wash line. Draperies, carpets and other bulky articles can be sprayed with the solution with an ordinary garden sprayer.

The boric acid-borax mixture not only fireproofs but it is a check against deterioration of curtains and other fabrics exposed to the invisible sulphuric acid gas poured into the air by the burning of coal and other sulphur-containing fuels.

Fireproofing does not prevent fire from scorching or charring a fabric but it does prevent it from bursting into flame and spreading the fire. The fireproofing chemicals melt and seal off the fibers of the treated fabric. The melting chemicals also act like a miniature automatic sprinkler system in that they give off moisture that combats the flames.

Science News Letter, March 5, 1938

Bees prefer nectar that is rich in sugar, a scientist has observed.

BIOCHEMISTRY

Vitamin K, Fish Meal Product, Aids in Treatment of Jaundice

Vitamin B₄ Now Available in Crystalline Form; Root Growth Substance Shown to be Vitamin B

VITAMIN K, from fish meal, together with bile salts, is now being used as an aid in the treatment of jaundice, the disease that turns people yellow. A preliminary report of encouraging results at the Mayo Clinic, at Rochester, Minn., has been made.

The jaundice is the kind known as obstructive jaundice because it is due to obstruction of the flow of bile. The new vitamin treatment does not help the jaundice but controls the bleeding which is a dangerous feature of the disease. Treatment of the jaundice itself is operation to remove the obstruction to the bile flow, but this is not always possible because of the tendency to uncontrollable bleeding.

More Data Needed

The new treatment has been used in 18 cases, Drs. H. R. Butt, A. M. Snell and A. E. Osterberg report. In certain cases, they state, this treatment "probably has prevented hemorrhage or has had a definite inhibitory effect on actual bleeding."

"We realize," they add, "that much more data must be collected before any definite conclusions may be drawn and that the whole problem is one of extraordinary complexity."

The complexity arises from the fact that in spite of much research over many years by many scientists, the exact

mechanism which normally prevents hemorrhage by making blood clot when it is shed is still not too well understood.

The results with the treatment so far encourage the Mayo scientists to believe that prevention and control of the bleeding tendency of the jaundiced patient may be attained in the "not too distant future."

From Many Sources

Vitamin K is a relatively new vitamin found in hog liver oil, cabbage, spinach, tomatoes, alfalfa and various other natural sources. Dried alfalfa meal was at first used in the treatment at the Mayo Clinic, but as the patients could not tolerate this for long, the vitamin is now being obtained from fish meal. It is given together with bile or bile salts.

Lack of vitamin K in the diet of chicks and certain other animals causes hemorrhagic or bleeding disease. In human patients suffering from obstructive jaundice, the bleeding apparently occurs because damage to the liver caused by obstruction to the flow of bile from the gall bladder makes it impossible for the patient to utilize the vitamin K in his food.

Step by step the various parts of vitamin B are becoming available in pure form for possible dietary use and further scientific study. Pure crystals of

the part of the vitamin known as Factor I have now been obtained by Dr. Samuel Lepkovsky, associate professor of poultry husbandry at the University of California. This is the fourth of the five known parts of vitamin B that is available in crystalline form, Dr. Lepkovsky points out. (*Science*, Feb. 18). The other three, thiamine, riboflavin and nicotinic acid, have previously been crystallized by other investigators.

Factor I crystals are described as "colorless rods which aggregate mostly as rosettes and sometimes in fan shapes." Rats living on a diet that lacks this vitamin factor stop growing and get a skin disease of feet, paws, ears and areas around the mouth. Feeding tiny amounts of the crystals cures the condition and makes the animals gain weight immediately. What the Factor I crystals will do for humans and other animals has not yet been determined, but all vitamins are important for normal growth and development. One of the parts of vitamin B is useful in preventing and curing pellagra.

Roots Need Vitamin

Plant roots must have minute supplies of vitamin B₁, otherwise known as aneurin, if they are to grow, Drs. F. W. Went, James Bonner, and G. C. Warner of the California Institute of Technology announce. Experiments have shown that the quantity needed is exceedingly small, measurable in only a few parts per million of solution, but that if roots are entirely deprived of it they will not grow. The growth of roots is started by another substance called auxin, but the vitamin is necessary for its continuation.

Vitamin B₁ has been known for some time as a food element necessary for the normal functioning of the nervous system. It is always obtained from plants, but until now its use to the plants themselves has not been known.

Science News Letter, March 5, 1938

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WHICH 1938 AUTOMOBILES ARE BEST BUYS?

Consumers Union's Annual Report on Automobiles Rates Over 46 Models in Order of Merit

Are you planning to buy a 1938 car? With prices up 10% you'll want to know which car at the price level you're prepared to pay will operate most economically, which one has the soundest mechanical construction, which is safest to drive—in short, which car will give you the best value for your money.

Divided into eight price groups (ranging from below \$700 up to \$2300) more than 46 models of 1938 automobiles are rated by name as "Best Buys," "Also Acceptable," and "Not Acceptable" in Consumers Union's annual report on automobiles just published in the February issue of *Consumers Union Reports*. This report was prepared by unbiased automotive experts and is based on driving tests, and engineering examinations. The report evaluates the new overdrives, fourth speeds and other innovations in transmissions and shifting devices, discusses brakes, riding qualities, durability, steering and safety, and gives a table showing the "gas consumption factors" for the various cars. Among the cars discussed by name in this report are the Ford, Buick, Packard, Willys, Oldsmobile, Chevrolet, Hudson, DeSoto, Lincoln and Plymouth.

Read this report before buying a car. It will give you a sound basis for making an intelligent and economical choice. The report may be ordered by filling out and mailing the coupon below.

HOW TO BUY AN INSURANCE POLICY

In the fourth installment of a series of reports on life insurance—also appearing in the February issue of *Consumers Union Reports*—CU's insurance consultants point out the soundest and cheapest form of insurance available, naming the companies which supply this type of insurance. Also continued in this issue are the series of reports on HOME BUILDING & BUILDING MATERIALS and VITAMINS. Your subscription to *Consumers Union Reports* may be begun so as to include all of the reports in these series. Simply write the name of the month with which you wish to begin in the coupon. Here are the issues in which these series appeared (together with a partial list of the other subjects covered in these issues)—NOV., Life Insurance, Portable Typewriters, Anti-Freezes, Men's Hats; DEC., Life Insurance, Radios, Playthings, Electric Shavers, Cigars, Lipsticks; JAN., Life Insurance, Home Building and Building Materials, Vitamins, Auto Batteries, Lisle Stockings.

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(You'll find them in the February Reports)

AUTOMOBILES

What innovations in some 1938 cars boost gas mileage about 20% at high speeds?

How can you avoid "overbuying" when you go to purchase a 1938 car?

Of the four cars in the Economy Group (Plymouth, Ford, Willys, Chevrolet) which one was found to be the best buy by competent engineers?

What factors will conserve the durability of your car, minimize adjustments, and increase operating economy?

VITAMINS

Up to what age should children be given cod liver oil?

How many units of Vitamin D is the proper dosage for infants?

Is cod liver oil toxic?

What are the advantages and disadvantages of artificial sunlight?

LIFE INSURANCE

For permanent, constant protection what is the cheapest and soundest insurance available? What companies sell this type of insurance?

Why do certain insurance companies refuse to sell certain types of insurance to women, Negroes, and manual workers?

HOME BUILDING

What factors should you consider in selecting a site for your home?

What factors should you consider in planning the arrangement and size of your rooms?

Should the outer style of your home be decided upon first or should it develop from the inside plan?

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GENERAL SCIENCE-LANGUAGE

Translations And Microfilm Unlock Science From Abroad

TEACHING of modern languages and actual translation of scientific papers of practical use to research workers is combined in work at the North Carolina State College of Agriculture and Engineering by Prof. L. E. Hinkle.

Several years ago Prof. Hinkle found that the best way to teach French, German, Spanish and Italian was to have his students use recent scientific material for reading assignments. This was so successful in enhancing interest that Prof. Hinkle devised a plan whereby students would make translations of scientific literature that would be useful and available to others.

The U. S. Department of Agriculture, through Miss Claribel R. Barnett, Librarian, lent its cooperation and its library is acting as a clearing house for translations that others may make and wish to place in circulation.

Science Service and the American Documentation Institute are collaborating in making the translations available in microfilm form at small cost. Forty-one of the translations have been deposited by Prof. Hinkle's Translation Service and are now available. An account of the origin, growth and development of the Translation Service is contained in a bulletin which will be sent free as long as the supply lasts, upon request to Prof. L. E. Hinkle, North Carolina State College, Raleigh, N. C.

To obtain any of the following translations in microfilm, order by document (Doc.) number and remit the price indicated to *Bibliofilm Service, Care Library of the U. S. Department of Agriculture, Washington, D. C.* For apparatus with which to read microfilm, inquire of Science Service, 2101 Constitution Ave., Washington, D. C.

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Science News Letter, March 5, 1938

GEOLOGY

Mineral Veins in Rockies Younger Than Mountains

Rich mineral veins of the Rocky Mountain region of Colorado were formed shortly after the mountains were upraised, Drs. T. S. Lovering and E. N. Goddard, of the U. S. Geological Survey report. (*Bulletin of the Geological Society of America*, Jan.)

Dinosaurs were dying out 75,000,000 years ago when the Rocky Mountains started to push their way out of the Pierre Sea, and slowly, during hundreds of thousands of years, rose to their present height. Long afterwards, volcanoes erupted in the mountains, throwing out vast clouds of dust and spewing forth great sheets of lava. From the depths beneath these volcanoes minerals of value to man were carried upward by hot water, and deposited sixty million years ago in the veins from which they are now mined.



Life Begins at 40 Degrees

LIFE in the woods, meadows and marshes begins at forty degrees or less. The soil may still be solid with frost, beneath a thin top layer of mud thawed only since morning; a crust of crisp ice may still seal the shallow puddles, yet skunk cabbages push their impudent purple noses up, alder bushes hang out their drooping catkins, and soft-maple flowers burst forth.

How do they get that way? Shouldn't the nights, still hard-freezing, paralyze their sap into ice? Where do their roots

find any available water in the still-solid ground?

The answer to this riddle of precocious plant activity is far from being completely known. The factors involved are many and complex; it is highly probable that many of them have not yet been discovered or even guessed at.

One such factor, however, almost indubitably is the fact that sap is not water, and does not freeze as easily as water. While water in the puddles and in the crevices of the soil is still frozen solid, plant saps have already become fluid. Their freezing points are quite definitely lower than the 32 degrees Fahrenheit that marks the immobilization of "straight water" as ice. So sap is free to move in response to the warming of the sun, as it falls on the dark stems of plants or on the good black earth, while water must remain at a standstill.

What makes sap thus fluid while water is still solid?

You can find the answer, in part, in your own electric refrigerator. Everybody knows that ice cubes form nicely, while ice-cream or sherbet mixes, and fruit and vegetable juices, show considerable resistance to freezing.

All sorts of things are in solution in these defiers of refrigeration. The fruit and vegetable juices may interest us most for present purposes, for they are most nearly like the saps that flow in plant stems. They contain mineral salts, a good deal of sugar, usually some acids, and practically always some mucilage-like substances which chemists learnedly call "higher carbohydrates."

Now, practically any solid substance dissolved in water will make it harder to freeze. That is the secret of the now almost universally used solid anti-freeze compounds in automobile radiators. Just so, these various solids dissolved in the watery basis of plant saps enables them to become fluid while water on and in the ground still remains frozen solid.

Science News Letter, March 5, 1938

RADIO

March 10, 4:00 p. m., E.S.T.
HOW FAST DO BIRDS FLY?—Miss May T. Cooke of the U. S. Bureau of Biological Survey.

March 17, 4:00 p. m., E.S.T.
ROOTS WITHOUT PLANTS—Dr. Philip R. White of the Rockefeller Institute for Medical Research.

In the Science Service series of radio discussions led by Watson Davis, Director, over the Columbia Broadcasting System.

Science News Letter, March 5, 1938

*First Glances at New Books

Mechanical Engineering

A HUNDRED YEARS OF MECHANICAL ENGINEERING—Edward Cressey—*Macmillan*, 340 p., \$4.25. Engineers, especially the "mechanicals" will find this book of great interest for it is no "boy's book" of invention. There is plenty of meat for the technical reader yet the material is presented with interest and good arrangement and illustration.

Science News Letter, March 5, 1938

Science—Biography

FAIRY MEN OF SCIENCE (New ed.)—Sarah K. Bolton—*Crowell*, 376 p., \$2. Here is the sixteenth printing of this popular book which first appeared in 1889. This newest edition has been enlarged and improved and new chapters have been added to include Thomas A. Edison, the Curies, and Marconi.

Science News Letter, March 5, 1938

Parapsychology

AN EXPERIMENT WITH TIME (4th ed. rev.)—J. W. Dunne—*Macmillan*, 297 p., \$2.75. Giving the author's explanation of the prophetic type of dream as a sort of reversal in the ordinary course of time.

Science News Letter, March 5, 1938

Chemistry

GERMAN FOR CHEMISTS—John H. Yoe and Alfred Burger—*Prentice-Hall*, 537 p., \$4.50. New text of the University of Virginia on the reading of chemical German. The book is well graduated in its scale of complexity and contains a very large amount of material.

Science News Letter, March 5, 1938

Chemistry

MODERN THEORIES OF ORGANIC CHEMISTRY—H. B. Watson—*Oxford Univ. Press*, 218 p., \$4.50. Wave and modern quantum mechanics applied to organic chemistry. Research physicists and chemists, and departmental libraries in universities will want and need this book.

Science News Letter, March 5, 1938

Chemistry

OUTLINES OF METHODS OF CHEMICAL ANALYSIS—G. E. F. Lundell and James Irvin Hoffman—*Wiley*, 250 p., \$3. A worth-while textbook with a different point of view. The authors point out that there has been a tendency in this field to concentrate on the final act of a chemical analysis—the determination—at the expense of the complete analysis itself. As a result, there is plenty of information about the determination of elements when they occur alone, but all

too little information on the essentials of chemical separation that can be applied to mixtures of elements. It is to balance this one-sided development of chemical analysis that the present book has been written.

Science News Letter, March 5, 1938

Psychology—Education

GUIDANCE AND CHARACTER SERIES—Altoona, Pa. City Schools under the direction of Robert E. Laramy—*School and College Service*, 7 books, \$2.60. Happy Streets, 63 p., Straight Paths, 64 p., What Allan Learned, 64 p., Looking Ahead, 64 p., Doing Right, 64 p., Better Citizens, 64 p., Teaching Manual, Book I, 158 p. Written for grades one to six, under the direction of the superintendent of the Altoona city schools.

Science News Letter, March 5, 1938

Psychology—Education

GUIDANCE AND CHARACTER SERIES—Altoona, Pa. City Schools, under the direction of Robert E. Laramy—*School and College Service*, 7 books, \$3.65. You and Your Friends, 126 p., You and Your School, 126 p., You and Your Inner-Self, 126 p., Who Are You? 126 p., Desirable Goals, 126 p., After High School, What? 126 p., Teaching Manual, Book II, 189 p. A series written (in the order named) for grades seven to twelve. A continuation of the elementary series, also written under Mr. Laramy's direction, they are unusually readable little books.

Science News Letter, March 5, 1938

Safety

MODERN SAFETY SERIES—*School and College Service*, 5 books, \$1.50. Home Safety—May N. Steinman and Hazel S. Krumm, 62 p., School Safety—May N. Steinman and Hazel S. Krumm, 62 p., Public Safety—May N. Steinman and Hazel S. Krumm, 62 p., Automobile Safety—H. B. Allman and P. D. Burkhalter, 94 p., Sense and Safety—J. W. Irwin, Comp., 64 p. The first three books are suitable for intermediate grades or junior high school, the last two for senior high. They are thoroughly readable, and designed to stimulate classroom discussion.

Science News Letter, March 5, 1938

Pharmacognosy

DRUG ATLAS FOR STUDENTS OF PHARMACY AND MEDICINE—Compiled by W. Scarnell Lean—*Longmans, Green*, 16 p., 75 c.

Science News Letter, March 5, 1938

Medicine

AN ANALYSIS OF THE RESULTS OF TREATMENT OF EARLY, LATENT, AND MUCO-CUTANEOUS TERTIARY SYPHILIS—W. R. Snodgrass and R. J. Peters—*His Majesty's Stationery Office, London*, 126 p., 2s. A technical report for physicians and public health authorities, but which has one important message for the general public. These are the authors' findings, corroborating those of other students of the subject, that the spread of syphilis cannot be checked and the disastrous late-effects of the disease cannot be eliminated until the importance of adequate early treatment is generally recognized.

Science News Letter, March 5, 1938

Biostatistics

PRINCIPLES AND METHODS OF TREE-RING ANALYSIS—Waldo S. Glock—*Carnegie Institution of Washington*, 100 p., 15 plates, \$2 paper, \$2.50 cloth. So many archaeologists and climatologists are studying tree rings, as a valuable aid to understanding the past, that a text of this sort should prove widely useful. The method explained is that evolved by Dr. A. E. Douglass.

Science News Letter, March 5, 1938

Biography

CLEOPATRA—Emil Ludwig—*Viking*, 342 p., illus., \$3.50. This version of Cleopatra's intrigues and fortunes gives us "the psychological life of the heroine and her three Romans." As a biographical idea, this is attractive. However, some readers will not care for the experiment of describing long, imaginary thoughts in Cleopatra's mind, in order to avoid writing imaginary dialog. Somehow, thoughts prove harder reading than talk.

Science News Letter, March 5, 1938

Physics

ELEMENTARY PRACTICAL PHYSICS—Newton Henry Black and Harvey Nathaniel Davis—*Macmillan*, 710 p., illus., \$2. Here is another in the long line of Parke and Davis elementary physics textbooks for high school. New illustrations and the usual clear diagrams make it even better than its well-known predecessors.

Science News Letter, March 5, 1938

Biology

ATLAS OF CAT ANATOMY—David B. Horsburgh and James P. Heath—*Stanford Univ. Press*, 39 p., \$1. A clean-cut laboratory workbook for first-year biology students.

Science News Letter, March 5, 1938